

# SCIENCE.

FRIDAY, JANUARY 29, 1886.

## COMMENT AND CRITICISM.

THE ATTITUDE of Professor Newcomb towards the alleged discoveries in regard to thought-transference is one of extreme intellectual dissent, and will necessarily accentuate the impression of exceedingly great conservatism, which already prevails in regard to the American society for psychical research. His presidential address was essentially a frank though delicate denial, not only of the results concerning telepathy claimed by the English society, but also of the utility of pursuing any investigations upon the subject further. There appear, however, certain flaws in his argument, which are sufficient to prevent one from bluntly adopting his conclusion. He places much emphasis, for instance, on the extreme rarity of thought-transference in the ordinary course of life, and implies somewhat sarcastically that it ought to be much more frequent. To a physiologist, however, the possibilities appear differently: it is quite conceivable that telepathic irritations are extremely feeble, and are accordingly usually completely obliterated by the ordinary and much stronger irritations of daily life; just as the feeble sensations from the stars are obliterated by sunlight, so that, as aptly remarked by Dr. Bowditch, a man conscious only during the day would not discover the stars. Again, he states that telepathy is communication between two minds without the intervention of any physical agency. This certainly cannot be accepted as a correct definition; for telepathy means communication through other than the usually known sensory processes, and there is nothing in the hypothesis to exclude all physical agencies. So long as the physicists have to acknowledge action at a distance of gravity and electric induction, it is certainly no dishonor to any intellect to accede to the possibility of the action at a distance of mind, sufficiently to consider that possibility worthy of investigation, even though he has little expectation (and most scientific men have very little) of a positive result. We have alluded to the weak points of Professor Newcomb's address: the two strongest points are in criticism of the work of the English society. He finds

fault very justly with their failure to ascertain the influence of varying conditions on thought-transference; and he further makes the very acute observation that in the reproductions of the drawings, though the lines are faulty, they always join perfectly, as would be the case with the work of a poor draughtsman who could see; and this, too, in the drawings made blindfold. The inference, which Professor Newcomb refrains from making, is, of course, that the person did see, and there was some trickery. By way of general criticism of the English society's work, we may frankly say that it is like that of amateurs and enthusiasts, and bears the character of such work, especially because it fails to deal rigidly and skilfully with the problems as they appear to professional physiologists and psychologists.

THE TWENTIETH ANNUAL REPORT of the Massachusetts commissioners of inland fisheries gives some facts of interest on the fisheries of that state. In many places, where the culture of land-locked salmon had been deemed a failure, the fish has appeared in numbers. Of the river-salmon there has been an increased run in the Merrimack River the past year, and, were it not for the depredations that have been committed, the river would now be self-sustaining. In Maine the salmon-fisheries have been greatly increased, and the catch for the past season is said to be the largest for fifty years. Shad-hatching was continued at North Andover, with good results. The river was found to be full of male shad from one to two years old. These young males return with the mature females, while the females do not return till they are three or four years old. Owing to the prejudice that existed, the artificial hatching of shad was abandoned for several years, with the result, that, on the Connecticut River, the value of the shad-fisheries fell off more than fifty per cent on the upper waters, and twenty-five on the lower. The resumption of hatching, however, has prevented further decrease, and an improvement is expected next year. Hitherto but little has been done for the cultivation of the carp in Massachusetts, under the impression that the state was too far north for such to be successful. That the idea is erroneous is clearly shown by several large ponds in the state, already heavily stocked with this fish.

In the autumn of 1881, sixty-seven carp were placed in a pond near Worcester: they have grown and bred very rapidly, without especial care having been given to them; so that the pond is now full of fish from four to twenty-five inches in length, and weighing as high as sixteen pounds. The most important fact connected with the other fisheries is the decrease in the catch of some of the more valuable kinds, such as the striped bass, Spanish mackerel, and bluefish; the last especially has everywhere been found less abundant than in recent years.

A MOVEMENT is before congress to establish a commission to determine the feasibility and value of inoculation with the causative agent of yellow-fever as a preventive of that disease. Dr. Walcott, president of the American public health association, and Dr. Holt, president of the Louisiana state board of health, appeared before the senate committee on epidemic diseases last week in this interest, accompanied by Drs. Billings, Toner, and Smart, of Washington. It is proposed to establish a commission to go to Mexico and South America to investigate the system of inoculation of Freire and Carmona, whose experiments have proved so successful in those countries, and also to investigate the principles of Pasteur, Koch, and others, in their special application to yellow-fever. The proposed bill will be reported favorably to the senate, and there is strong reason to hope for similar action in the house. The plan offers the possible emancipation of the people living in yellow-fever districts from the dominion of a pestilence which frequently costs tens of thousands of lives and hundreds of millions of dollars.

THE EXTREMELY COLD WEATHER at the south during the present season has strengthened the popular impression that the region in question is subjected to greater ranges of temperature and a less equable distribution of rainfall than formerly. With a view of testing the correctness of this impression, the Alabama weather-service has collected from the early Spanish, French, and colonial records, a mass of references to the weather. This 'record of the weather' goes back to 1701, when it was recorded by one of the French officials resident in Louisiana, that "the water has been so intensely cold that water poured in a tumbler to rinse it froze instantaneously." The records of 1711, 1718, and 1723, refer to destructive floods in

the lower Mississippi; and in 1732 a hurricane is reported in Louisiana which "destroyed the crops, resulting in extreme scarcity of provisions." A number of references to hurricanes are given in the record; but, in all probability, they were of the same local nature as the tornadoes of the present day. The record is published as 'Special paper of the Alabama weather-service No. 1,' and is evidence that the service is desirous of doing its share toward adding to the valuable meteorological literature of the day. The editor of the 'record' is, however, an historian as well as a meteorologist, as he opens his work with a sketch of the early history of the Gulf states, and, under the date 1736, says nothing of floods, cold, or winds, but does tell us of "Bienville's expedition through Mobile, up the Bigbee River to Old Town Creek, thence north-west to the Chickasaw villages a few miles north-west of Tupelo, where the battle of Ackia was fought and the French badly defeated. Near the same spot D'Andreville shared a similar fate in 1753; and DeSoto, in March, 1541, fared but little better." Is not this an unnecessary mixing of sciences?

"A DEBT OF \$135,000 encumbers the Cincinnati zoölogical gardens, and it is announced that they must be sold unless the business-men of the city come to the rescue. A system of private subscriptions is proposed by the managers, whereby there is a faint hope of securing a longer lease of life." In such words is the announcement made in the daily press of the present condition and probable fate of the Cincinnati gardens. In *Science* of Nov. 13, we referred to the financial difficulties of the Philadelphia zoölogical garden. It is certainly greatly to be regretted that sufficient support cannot be obtained in this country for these institutions. Boston and Washington are anxious to have zoölogical gardens; but the projectors will receive little encouragement from the financial history of those now in existence.

IN VIEW OF THE RECENT announcement that the faculty of Harvard college has decided to again allow the students to take part in intercollegiate football matches, it is interesting to note the frequent cases of football accidents to which the *Lancet* calls attention. That paper states that on Jan. 11 an inquest was held at Bridgewater, England, on the body of William Poole, aged twenty, who came by his death from injuries received whilst

playing in a football match on Dec. 28. The deceased, who was playing a very fast game, slipped and fell, and at the same time received a severe kick, probably in the abdomen, while several other players fell upon him. His death resulted from hemorrhage, arising from injuries to the internal organs. The *Lancet* goes on to say, "If proof of this [the dangerous character of the game as played in England] be wanted, it is furnished by the fact that this is at least the third fatal accident directly due to football already recorded thus early in the season."

THE HEAVY MORTALITY among the Baptist missionaries in the Kongo country has led Dr. Prosser James to write a series of letters, embodying descriptions of the principal diseases of tropical countries. These letters are entitled 'Health on the Kongo,' and are intended for circulation among the missionaries and the station officials of the Kongo Free State. It is to be hoped that Dr. James has in this way contributed to the well-being of the voluntary exiles in central Africa. Mr. Stanley still persists, that, with care, a European may successfully resist the inroads of the malarial influences to which he subjects himself on emigrating to the banks of that river; and every particle of wisdom which it is possible to impart on how to travel in Africa, how to locate a station, how to eat, dress, work, and sleep, must be a god-send to the adventurers. It is just such information that the letters are intended to give.

AT THE LAST ANNUAL meeting of the trustees of the Mount Auburn cemetery of Boston, Mass., it was voted that the trustees consider the expediency of establishing a crematorium, or of adopting any other method of taking care of the dead so that the sanitary law shall not be violated. The committee appointed, consisting of Mr. Roger Wolcott and Dr. R. M. Hodges, report that the acts of incorporation of the cemetery only permitted interment. Cremation has been legalized by the legislature of Massachusetts during the past year, and the cemetery will be prepared to receive for sepulture the ashes resulting from the process of incineration, and would prepare depositories above ground, or columbaria in the hill-sides, for the reception and preservation of urns and other memorials. These actions of the legislature and trustees are worthy of note, as showing the wide interest cremation is now attracting in America, as well as in Europe.

#### RECENT PSYCHICAL RESEARCHES.

THE American society for psychical research held its annual meeting on Jan. 11 last, at Boston, the headquarters of the society. There has been a steady and rapid growth in the number of associates; and, as the various committees are now well organized and at work, it is hoped that the society will display still greater vitality in the future. This fair prospect has, however, been disturbed in one respect by the president of the society, Prof. Simon Newcomb, whose address was read at the meeting. He devoted his attention to the work that has been done upon thought-transference, especially by the original English society, and endeavored to discredit the investigations and conclusions published by the English committee. In brief, Professor Newcomb's position is, that the phenomena of thought-transference, as heretofore recorded, are very rare and quite unexplained. Now, they may be due, he says, either to an unknown law of nature displayed under conditions we cannot control, or else to special circumstances which are unknown to us. In the former case we might compare the phenomena with those of electricity, which were at first rare, obscure, and beyond our control. Professor Newcomb, however, turns all his arguments in favor of the second alternative; but, as briefly indicated in our comments this week, his logic is open to criticism. The length of the address precludes a fuller discussion of it before its publication.

Dr. H. P. Bowditch gave an informal account of some experiments, which indicated to a slight extent the power of reproducing drawings by thought-transference. Dr. C. S. Minot presented the results of an analysis of the figures obtained from the attempts to transfer the thought of a single digit from one person's mind to another's. It was noticed in the returns of experiments that there was one case in which the person guessed a larger number of digits correctly than was probable on mere chance. Now, it so happened that this person displayed the, presumably unconscious, habit of guessing the digits by skipping irregularly by two or three numbers from 0, 1, or 2, up to 8 or 9, and then back again. When, therefore, the thousand digits upon his record of guesses were tabulated, the result was obtained, that, upon the average, the fourth digit guessed by him before a 9 was 3.3; the third, 3.4; the second, 4.2; the first, 5.4. After a 9 he guessed down the scale with equal regularity. No other person showed this peculiarity: hence it was evident that this guesser had followed out his personal psychological bent, and had not been reading the mind of the agent, who had thought

of the digit to be guessed. This confirmed the conclusion otherwise reached, that this case of success, called case E in the first report of the committee on thought-transference, was the effect of coincidence. It was further shown that this same person had marked preferences for certain digits, as is seen in the following table :—

Digit.....	1	2	3	4	5	6	7	8	9	0
Number of times guessed.....	97	92	122	117	106	101	112	90	85	78

The order of preference then was, 3, 4, 7, 5, 6, 1, 8, 9, 0. Moreover, in this series, 532 odd numbers stand against 478 even ones. That the number-habit, or the tendency to guess certain digits over-often, is actual and constant, was proven by the fact that these idiosyncrasies were shown in each set of 100, although made at various times. Similar examinations of the digits guessed by other experimenters showed in every case a more or less marked and constant number-habit, distinct for each individual, thus giving more evidence that in every instance there had been an absence of mind-reading. Putting about 9,000 guesses by thirteen persons together, and averaging them, it was found that the digits are to be ranked in the following order of preference, which is certainly very curious : 3, 5, 4, 6, 2, 7, 8, 9, 1, 0. About as many prefer odd as even numbers ; but most persons prefer one or the other. Thus one guesses 466 odd and 534 even, but another 526 odd and 574 even. It is evident that the power of unconscious habit extends into details the most minute, and plays a much greater rôle in our mental life than is commonly admitted.

Professor Royce, on behalf of the committee on apparitions, announced the completion of a circular asking for the communication of stories to the committee. The speaker's remarks well expressed the attitude of the committee, which is sufficiently unlike that of the corresponding English committee to deserve mention. The starting-point is the viewing of the experiences in question as actual psychological facts ; in going further, the tendency will be, at least on Professor Royce's part, to study how far these experiences are governed by the dictates of folk-lore, and to eliminate those stories which belong in the already well-known class of hallucinations. The search for an objective basis for the experience, for a specific external cause, is incidental only, and must follow after the exclusion of cases explicable by folk-lore hallucinations, etc. The English investigators wish too obviously and too eagerly to demonstrate the objective foundation of apparitions, and so have quite omitted to subject their material to the study which must come first, if the work is to be sound. Apparently they already

accept an apparition seen by several persons as a *bona-fide* ghost, at least very probably. It need hardly be pointed out that the position taken by Professor Royce is much higher, his attitude more scientific, than this. The result of the committees' labor will therefore be awaited with great interest.

The meeting closed with some remarkable experiments by Dr. William James, who mesmerized Mr. Carnegie, one of the committee on hypnotism. While the latter was in the trance, Dr. James told him he could not see the chairman, with the effect of rendering him blind to that officer. Placing a prism in front of Mr. Carnegie's eye, so as to produce two images on his retina, Dr. James asked what he saw. The answer showed that he saw only one chairman, and therefore remained blind to one of the two images. This is believed to be quite a new fact in hypnotism. To show that although the subject adopts any suggestions made to him as to his sensory images, no matter how false the suggestion, yet he has extreme delicacy of perception, the following experiment was made : the subject was made to see an imaginary photograph of President Cleveland on a blank sheet of paper ; the photograph was made, in the subject's vision, to leave the sheet of paper and travel round the room ; behind Mr. Carnegie's back the paper was turned upside down ; the photograph was now made to seem to Mr. Carnegie to return to the paper, which was handed to him ; he immediately turned it about to its previous position. Thus an hypnotic subject can be made to believe in a sensation which is unreal, and yet can distinguish between the two ends of a blank piece of paper. Of course, the interest of these experiments is genuine only for those who have faith in the honesty of the two gentlemen. Those who do not wish to believe, may remain agnostic ; but even they have to submit to the truth when experiments are made with animals. It may be added incidentally that Dr. Minot, in his studies on the growth of animals, habitually, he informs me, hypnotized his hens upon the scale-pan to keep them still while being weighed, — a useful practical application of hypnotism.

V. P.

#### THE AMERICAN ENGINEERS' MEETING.

THE annual meeting of the American society of civil engineers was held in New York, Jan. 20-21. The last meeting of this society was held at Deer Park, Md., on June 24-26. At that meeting, it was reported, more business was transacted and more discussion elicited than at any previous convention of the society. It was a meeting in a

small, out-of-the-way place, and the opportunities for having a good time were insignificant. The meeting in New York was apparently of a different character, very possibly not less beneficial to the members. Wednesday was devoted to the routine business of the society and the discussion of papers; but on Thursday the members of the society took advantage of the invitation of the managers of the new Croton aqueduct, and made an excursion of inspection along the line of the work.

Two prizes were awarded at the meeting, — one for a paper by Mr. Elliot C. Clarke of Boston, on a report on cement tests; and the other to Mr. A. M. Wellington, for a paper on experiments on journal friction at low velocities. The committee on uniform standard time reported encouraging progress, and stated that seventy-one managers of railways in America have favorably considered the twenty-four o'clock system, and that the Canadian Pacific railway has adopted it, and has changed its time-tables, its clocks, and the employees' watches, to adapt them to the new standard.

At the last meeting, Prof. T. Egleston of Columbia college presented a paper on the cause and prevention of the decay of building-stone. At this meeting Professor Egleston had something to say in regard to the disintegration of the surface of the obelisk in Central park, and took ground similar to that of Mr. Arnold Hague, whose views were published in *Science* for Dec. 11, and held that the disintegration was due to the great changes in temperature to which the obelisk is now exposed, and that the coating of paraffine might arrest the decay, but that nothing short of housing would stop it entirely. He stated that granite will absorb about one per cent of moisture, but that he had found that specimens from the side of the obelisk in London will absorb over seven per cent, this increase being due to its disintegrated condition. So far as the paraffine keeps out moisture, and thus prevents the formation of ice in the cracks, it would aid in the preservation of the stone.

Dr. Rothwell exhibited a system for submarine tunnelling. The company which Dr. Rothwell represents is contemplating tunnelling the Northumberland Straits to Prince Edward Island, which is now often cut off from all communication with the rest of the world for a month at a time, on account of the ice.

The next meeting of the society will probably be in or near Denver. The officers for 1886 are: president, Henry Flad; vice-presidents, T. F. Rowland, T. C. Keefer. The secretary and librarian, John Bogart, was re-elected.

#### ACCESSIONS TO THE NATIONAL MUSEUM.

THE most complete catalogue ever printed of the Catlin collection of Indian paintings, now in the national museum, will shortly be issued, and will be profusely illustrated. The manuscript is now in the hands of the printer. This catalogue will form an appendix to the 'Report of the national museum for the half-year ending July 30, 1885.'

The national museum has recently received from Paris four life-sized models of Africans, executed by Jules Hebert, — a Wolof, from Cape Verde; a Bambarra, from the upper Niger; a Soumali, from Cape Gardafui; and a Masai, from Lake Victoria Nyanza. These models are clad in native costume, and form a very attractive group in the museum.

AN interesting example of the manner in which the Eskimo amuse themselves is afforded by a collection of twenty-five ivory carved figures, made by Mr. J. W. Johnson at Fort Alexander, Alaska. The group represents the game, 'the tug of war.' Two Eskimo on a raised platform are pulling at a drum-hoop, each one trying to dislodge the other from his position. A group of musicians are playing instruments in the foreground, and the spectators are located on the sides, enjoying the fun. The effect is very spirited, and the whole scene exhibits rare ingenuity.

One of the old tally-sticks used by the bank of England to keep account of loans, before the present system of banking was invented, has recently been acquired by the museum. This specimen bears the date of 1776, and represents a hundred thousand pounds of a loan made at that time. The stick is about four feet in length, and notches are cut on both sides of it. The stick is then split, the government holding one half, and the creditor the other. It is impossible to make any change in the condition of the loan by either party, because the notches on the two sticks would no longer fit, and thus fraud would be detected.

#### WORTHLESS BAYONETS.

THE examination of bayonets at Aldershot has revealed a state of affairs which is disgraceful to the English war-office, and most discouraging for the public. Three regiments have submitted their bayonets to the test, — the first Royal Lancashire, the second West Riding, and the first Seaforth Highlanders. All turned out very badly, but the badness was not uniform. Out of 700 bayonets belonging to the West Riding regiment, 55 broke under test, and 180 were found soft and otherwise defective, giving an average of failures of a little

over 33 per cent. The Seaforth Highlanders were a little better off, 169 of their bayonets and some sergeants' swords being condemned. The Lancashire regiment had 600 bayonets examined, of which 223, or rather more than 37 per cent, were found to be unfit for use. Altogether 2,000 bayonets were tested, out of which 611 had to be condemned. This number, taken at random from the regiments which happen at the moment to garrison Aldershot, is sufficiently large to be considered a fair sample of the whole supply of bayonets to the British army.

The London *Times* reaches the very unpleasant conclusion that three bayonets in every ten, or, to be accurate, 3,055 bayonets in every 10,000, now in the hands of the British army in all parts of the world, will fail the English soldiers in the hour of need. Or, to put it another way, England, which spends such enormous sums upon its army, may reckon that it has at this moment an entire army corps supposed to be fit to go anywhere and do any thing, equipped with weapons which will double up like a pewter spoon under the impact of a fanatical Arab.

Nor is even this all. The public may be excused for entertaining some suspicions as to the quality of the bayonets which have passed the test. How many of them, the *Times* asks, have just escaped condemnation, and how many are in fact what they are in theory, and what the English government pays to make them, — the best article that can be produced alike as to material and workmanship? It would be decidedly curious were there no intermediate grades to be found between a first-class weapon and one visibly and unmistakably worthless. The probability is that there are many; and until there exist assurances to the contrary, much more convincing than any yet produced, men of business will be disposed to doubt whether the percentage of unexceptionable bayonets is as great as that of downright bad ones.

#### FARTHEST NORTH.

TAKING all things into consideration, the Greely expedition was the most unfortunate expedition that ever entered the Arctic. Newfoundland was scarcely lost to sight when the men began to grumble about their food. Before the Proteus left Lady Franklin Bay, the second in command quarrelled with his chief. Unfortunately he failed to catch the returning steamer, and remained to add a gloom to the terrible gloom of the arctic night, and to add one more to the useless sacrifice

*Farthest north; or, The life and explorations of James Booth Lockwood, of the Greely arctic expedition.* By CHARLES LANMAN. New York, Appleton, 1885. 16°.

on Cape Sabine. He soon found a confederate in the naturalist, and the two rarely spoke to Greely and Lockwood, the other occupants of the officers' quarters. Kislingbury and Pavy are both dead. We hope that Major Greely will go to the bottom of this matter, and tell us the true cause of so much discontent.

The next great misfortune which overtook the expedition was the death by starvation of the greater part of the force, owing either to the criminal negligence, or no less criminal ignorance, of those who had the relief in charge. The bodies of the dead heroes were brought to this country; but, before they were laid at rest, a noisy celebration was held in honor of the survivors. All honor to Brainerd, to Greely and the rest, but surely they would have preferred to have had better taste displayed in the matter. And now one of the foremost men of that party, a man whose name will forever rank with that of Payer in the annals of arctic discovery, has been most signally unfortunate in his biographer. No doubt, Mr. Lanman, if he had taken the time and care, and had possessed the requisite knowledge, might have written a good book; but the haste with which the present volume has been stuck together is apparent on every page. What is still more to be regretted is the omission of facts and descriptions which would have been interesting and useful to those familiar with the story of arctic exploration. Nevertheless, Mr. Lanman has printed many passages from Lockwood's journal, and there is much in them worth reading and thinking about.

The most noticeable thing in the book is the ease with which Lockwood, Brainerd, and the Eskimo Fredericks accomplished a journey to do a portion of which had cost Beaumont and his Englishmen so much suffering and disease. Why did the scurvy attack Beaumont's party, while leaving Lockwood, and in fact the whole expedition, entirely free? Surely no one will ever question Beaumont's energy and pluck. But why did he fail where Lockwood succeeded? It seems to us that this would be a profitable subject for the pens of Commander (now Captain) Markham, and his cousin (not brother, as Mr. Lanman says), the well-known secretary of the Royal geographical society, Clements R. Markham, — more profitable, indeed, than the assertions that Lockwood did not go farther north than Markham, and farther north and east than Beaumont. Lockwood thought that the weight of Beaumont's travelling equipment was enough to have used up any men. For our part, it seems probable that the cause lay deeper, and should be looked for in the difference between the winter quarters and diet of the two sets of men.

Another interesting statement is the following, from Lockwood's diary, as to the relative merits of Kane and Hayes: "Have been reading Kane and his travels. He is my *beau ideal* of an arctic traveller. . . . Hayes does not compare with him. Though beautifully written, there is an air of exaggeration about Hayes's book which destroys its interest. Dr. Pavy, who has hitherto been the advocate of Hayes, since his return from Carl Ritter Bay, seems to have changed his mind about him, and now agrees with Greely and me that Hayes never reached Cape Lieber. To have done so, he must have performed in part of his journey ninety-six miles in fourteen hours, — an impossibility." This, be it understood, is from Lockwood's diary as given by Lanman. The volume further contains a good portrait of the explorer, a poor map of his explorations, and no index.

#### THURSTON'S MATERIALS OF CONSTRUCTION.

THIS work, the author states in his preface, is an abridgment of the larger work by the same author, entitled 'Materials of engineering.'

It contains in a compact form for ready reference a large amount of valuable information concerning the properties of materials used in engineering constructions, and is undoubtedly one of the most complete works of the kind yet published in this country.

Students and practical engineers can hardly find any compilation better suited to supplement their theoretical text-books on the mechanics of engineering constructions than this. The work is not free, however, from some of the imperfections and faults which have characterized nearly all books of this kind, heretofore produced, by English and American authors. The title which is given to a text-book is perhaps of little consequence in itself; but under the titles 'Theory of strains,' 'Strength of materials,' 'Mechanics of materials,' etc., we have a variety of works, some of which are devoted to the exposition and demonstration of the theorems of applied mechanics relating to the action of external forces upon the parts of structures, and the resistances which oppose such forces, with a minimum amount of space devoted to the properties of the materials used; and in others the properties of materials, more or less fully treated, with a minimum amount of demonstration of mechanics so applied, but with working formulas, either introduced without demonstration or from experiments, — empirical formulas, — largely interspersed. This min-

*Text-book of the materials of construction.* By R. H. THURSTON. New York, Wiley, 1885. 8°.

gling of engineering constants and descriptions of the properties of materials with both demonstrated and empirical formulas, is perhaps necessary in such a work as that of Professor Thurston; but it requires great discrimination and art to accomplish this satisfactorily. The handbooks of Trautwine and Haswell are exceedingly useful works of this character. Professor Thurston aims to go a step farther in his formulas and explanations; but the mixing-up of theoretical demonstrations and formulas without demonstration is a fault in a text-book for students.

Some subjects are treated at great length, while others receive less notice; as, for example, those connected with metallurgy on the one hand, and the non-metallic materials on the other.

The introduction of pictures of a few of our most common trees, etc., in illustrations of timber, are out of place, and affect the character and dignity of the work, as such imperfect illustrations of familiar objects, seen almost daily and hourly in nature, are apt to prejudice the reader against the author.

Notwithstanding these defects, however, the work is a very valuable contribution to engineering as a book of reference for nearly all important questions connected with the properties of materials.

#### EXPLORATIONS IN ALASKA BY THE BROTHERS KRAUSE.

AMONG explorations in Alaska of late years, not purely for geographical purposes, the journey of the brothers Krause, under the auspices of the Bremen geographical society, holds a prominent and worthy place. Its progress was noted and its results chronicled from time to time in our pages. Numerous papers by the travellers themselves have appeared in European journals, the last being an account of the brachiopods and lamellibranchiate mollusks collected in Bering Sea and Strait, by Dr. Arthur Krause. Kurtz, Peters, von Martens, Reinhard, Hartlaub, Müller, Meyer, Richters, Arzruni, Poppe, and Kirchenpauer have reported from time to time on the natural history, mineralogy, and ethnology of the expedition. The volume under review is a consensus of all available information, both historical and recent, relating to the very interesting group of aborigines which occupy the greater part of the Alexander archipelago, with outlying villages as far north-west as the Copper River. It does not pretend to monographic com-

*Die Tlinkit-Indianer.* Ergebnisse einer reise nach der nordwestküste von Amerika und der Berings-strasse, ausgeführt im auftrage der Bremer geographischen gesellschaft in den jahren 1880-81, durch die Doctoren Arthur und Aurel Krause, geschildert von Dr. AUREL KRAUSE. Jena, Costenoble, 1885. 16+420 p., illustr. 8°.

pleteness, which would require far more profound and exhaustive studies, and much more time, than any one has yet found opportunity to give to it; but for the observations of the Messrs. Krause and their predecessors in the same field it is nearly exhaustive, and by far the most complete and satisfactory account of these people anywhere to be found. In the interest of our own students of anthropology, it would seem that an English translation would be extremely useful.

The volume opens with a sketch of the journey made by the expedition, followed by an historical *résumé* of previous explorations. This is succeeded by an account of the characteristics of the region inhabited by the Tlinkit, a chapter on their history, nomenclature, clans, totemic and tribal relations, and the position of their chiefs. The fourth chapter treats of their villages, houses, festivals, seasonal migrations, the practice of labretifery, native art (well-illustrated), and slave-holding. Then comes an account of their domestic life and customs, shamanism, and dances. A chapter is devoted to the Haida and other adjacent tribes, and another to the history of Russian and other missions among them. Lastly, we have a review of the language from a grammatical stand-point, a vocabulary, a bibliography of the literature of the whole topic, and an index.

The work is carefully and thoroughly done, and will be extremely useful and interesting to students of American anthropology. Since the miners and the missions, the navy and the mercantile element, are introducing all the changes which come with the van of civilization, it would be well, if, with this volume for a starting-point, the rapidly vanishing features of the Tlinkit culture could be permanently and monographically recorded before, as in so many other cases, it is too late. Whatever be done in this direction, we shall owe to Dr. Krause and his brother a debt of gratitude for the record which they have secured and made available, and to the society which made their investigations possible.

#### GEOGRAPHICAL NOTES.

**A mythical Danish island.**—On Danish maps near the east coast of the island of Bornholm, in the Baltic, a little island may be found named Christiansö. This is an error, for there never has been any such island there. It seems that about twenty kilometres from Bornholm is a little group of three islets, call Christiansholm, Frederiksholm, and Gräsholm, where long since were some fortifications, now in ruins, called Christiansö. How this name has been transferred to a mythical islet on the coast of Bornholm is a mystery.

**A study of the Danube.**—T. de Wogan has recently made a canoe voyage on the Danube, and has made a study of its sources. It appears that the river has a total length of 2,840 kilometres, and a total fall of 678 metres. The spring in the garden of Prince Fürstenberg, which has long been considered the source of the river, and is so entitled on a monument at the spot, which has been adorned at great expense by the prince, is only one of several springs in the same region, either of which has an equal claim to be so considered. In the early part of its course, the river loses much water through subterranean passages reached by fissures in its bed. These have been described by Dr. A. Knop, whose experiments have been repeated with confirmatory results by de Wogan.

**The condition of Borneo.**—T. Burls has visited the ancient capital of Borneo, the town of Bruni. It is situated on a river with muddy banks, about twelve miles from the sea. The houses are poor and small: they are built on piles, and thatched with palm-leaves. The sultan, alleged to be more than a hundred years old, has recently married a girl of fifteen, who is his one hundred and sixtieth wife. His territory has been the seat of several recent insurrections, which he has been powerless to suppress; and it is only a question of whether the authorities of Sarawak or those of the North Borneo company shall take possession of the rebellious districts. More than twenty British subjects of Sarawak were recently killed by the rebels on the Trusan River not far from Bruni.

**South American investigations.**—André Bresson has recently published a statistical and geographical work on Bolivia. Manuel Uribe Angel has just issued a work on the general geography and history of the state of Antioquia, with maps and twelve plates of antiquities, carvings, pottery, and inscriptions of a date anterior to the Spanish conquest. It contains very curious and important ethnological and linguistic material, beside valuable geographical documents relating to the little-known mountainous region traversed by the Rio Cauca, and bounded by Bolivia and Tolima from the Magdalena to the Atrato.

**Travels in Laos.**—The explorations of Dr. Neis in Laos during 1883-84 are recently published in more detail than the original accounts gave. Apart from their additions to cartography, they contain interesting notes. On reaching the Nam-u River, which he was the first to explore, some singular caves were observed. One is in a peaked hill, and is reached by steps cut in the rock. The second, near by but at a greater height, is difficult of access, but well repays a visit. The door with which its entrance is furnished is hung between



two enormous stalactites. It opens into a passage about twenty-five feet long, after which the cave enlarges to a great hall seventy feet in diameter, and with a tolerably level floor. The roof could not be distinguished by the light of the explorers' six candles. Everywhere the stalagmitic deposits assumed the most curious forms, such as draperies and figures. Every corner was filled with figures of Buddha, some in wood, many in bronze, some very large ones built of brick covered with carefully gilded cement. An attack of fever, due to the chill of the cave atmosphere, was ascribed by the guides to the anger of a cave deity. A sacrifice to him, and a large dose of quinine, restored the doctor's health for the time. Below the village of Pak-u are some rapids called Keng Luang, where for some distance the river is encumbered with numerous blocks of stone. On approaching these, the traveller could hardly believe his eyes, as the rocks seemed to present carved figures. On a nearer approach, they were seen to represent buffaloes, elephants, tigers, crocodiles, and even human figures or groups of immodest character. The natural form of the rock had always been utilized, and at fifty paces or so the figures were perfectly recognizable (much less so on a closer inspection), except the eyes, which appeared to have been recently recut, probably at the annual feast of waters, recently over. Neither the boatmen nor the inhabitants of the village near by, where the party camped, would give any explanation of these carvings, or even talk about them. In this village around the pagodas, a sort of carpet-gardening had been practised, plants forming the outline of various figures; and the trees of the river-bank had been cut into the form of statues. One group very ingeniously trimmed represented an elephant: a vine had been carefully trained to form the trunk. On some rocks near by were pictures of five personages, of which two had had the hair and beard recently touched up. No explanation could be had of the use or purport of these things. Above the village of Kok-han was a hill eight or nine hundred feet high, called the elephant mountain, very well recalling a couchant elephant. The eye, due to a bare spot on the hillside, appeared to be carefully kept in order by the local priests. The mountaineers of this region do a good business in rice, cotton, tobacco, lac, gold-dust, and the astringent bark which the Laotians mix with their betel. These people, in talking with each other, do not say, 'From what district (or town) do you come?' but 'What water do you drink?' all tribes, towns, etc., being denominated according to the stream or brook by which they are situated. The villages of these mountaineers are generally on some small

hillock which is surrounded by a palisade, the several houses being elevated on piles for greater security. These people are called Khas. When a stranger comes, he is always offered a sort of beer made of rice. The first to drink is to be the first of the company to die. In cases where great deference is intended, the whole household drink before offering to the guest. They appear to belong to one, probably aboriginal, race with the Mois and other tribes of the Indo-Chinese mountains. They are intelligent, brave, and active, and do not fear the Hos, or Chinese pirates, who descend upon and devastate the Laotian villages, and are the terror of these people. At a large town, Muong-son, Dr. Neis found the river literally covered with rafts, upon which regular houses were built. Even the governing mandarin lived on a raft. On the alarm being given, all were ready to cut their hawsers and float down stream to avoid the dreaded Hos. The Laotians, being much less numerous than the Khas, have given up growing rice in the exposed districts, and purchase it from Khas, giving tin and earthenware, cotton and woollen cloth, and tools in exchange. To grow a crop they said would be a certain means of inviting a raid of Hos. Owing to the troubled state of the country, the explorer was obliged, after doing much important work, to retire, and fortunately reached Bangkok in safety, with all his notes, maps, and collections.

**Explorations in Perak.** — Interesting notes on the tin-mining of the peninsula of Malacca have been made public by Errington de la Croix, who has spent several years there in his quality of mining engineer. The tin is derived from the *débris* of granitoid rocks, which form the backbone of the peninsula. The mineral grains are very pure, separated by sluicing from the gravel, of which they form about six per cent: the washed product contains sixty-five to seventy per cent of pure tin. The work is entirely performed by coolies. The native inhabitants of the country, Sakayas and Malays, do no work; indeed, hardly exert themselves sufficiently to plant fruit-trees and rice to afford more than a subsistence for themselves. Many are fishers, some hunting is done, and a few domestic fowl and pigs are kept. The Chinese have adopted the Malay superstitions in regard to the spirits supposed to guard the mines. The visitor must take off his shoes and close his umbrella, or the spirit of the mine will decamp and take all the ore with him. At each locality the surface soil is stripped off, and the gravel is excavated to a depth of about twenty-five feet in open cuts. At each mine is a small altar to the divinity of the place, on which the Chinese make offerings of fruit and tea, and

explode bombs in honor of the spirit. Here and there are curious vertical-sided buttes of limestone, generally too steep for ascent,—the remnants of a sedimentary deposit which seems to have once covered large areas. At the base of one of these are usually found grottos, affording interesting crystalline formations and pleistocene fossils. The country is largely covered with dense forests, patches of jungle, marshes, and a few natural clearings. The forests are nearly devoid of life: few flowers, and those nearly colorless, are found. Birds and mammals are absent, and are to be found only in the clearings, where are immense troops of wild boars, large pythons, deer, and the carnivores which prey upon them. The chief pest is the leech, of which two kinds are found. One inhabits wet places; the other, the shrubbery. The latter seem to have acute perceptions. At the least sound they are on the *qui vive*, and raise themselves on the branches, waving their bodies about, ready for attack. They are an inch to an inch and a half in length, and very slender, making their way through loosely woven fabrics or under the clothing with ease. The bite continues to bleed, and often forms angry sores which are long in healing. Travel is generally performed on elephants, if by land. Mr. Errington testifies with astonishment to the intellectual capacity of these animals, and declares that all the stories he has heard in regard to their intelligence fall below the reality. The last few years have witnessed a wonderful advance in the product of tin from this region. Under the enlightened protectorate of Great Britain, and the enactment of more favorable laws, the product has risen from two thousand tons in 1876, to over seven thousand tons of bar tin per annum in 1883. Large and well-built towns have arisen; and the future of the country is bright, and only needs the introduction of sufficient labor and suitable agricultural methods to be put on a permanently prosperous basis.

#### NOTES AND NEWS.

THE reports of the annual conference of librarians, which was held last summer at Lake George, extend through one hundred and seventy pages, a double number, of the *Library journal*. Amid a great deal of matter which relates simply to technical administration, and is therefore of interest to librarians only, there are several papers which will be useful to all those readers who have occasion to consult a public collection of books. Among the latter may be mentioned an account of the printing of the British museum catalogue, which is furnished by Mr. Richard Garnett of the museum.

Seventy-eight volumes, representing two hundred and ninety-five manuscript volumes of the museum, are printed already, fifty-eight of which are the letters A and B: twenty are from Virgil to Z. Extra copies of certain articles have been issued for separate sale; e.g., 'Aesop,' 'Aeschylus,' 'America,' 'Aristotle,' 'Bacon,' 'Horace,' 'Byron,' 'Swedenborg.' The great articles 'Academies' and 'Periodical literature' are nearly completed. 'Bible' is commenced, and it is hoped that 'Shakspeare,' 'Homer,' 'Liturgies,' and 'Dante' will follow at an early date. The catalogue, if completed, will be the largest catalogue in the world. Another noteworthy article, of a very different character, is that of F. B. Perkins of San Francisco, on the 'Free public library, its purposes and its abuses.' R. R. Bowker and T. H. McKee discuss the U. S. government publications and their distribution,—two instructive papers; E. M. Barton of Worcester advocates the distribution of duplicates; and W. F. Poole gives some excellent hints with respect to small library buildings. There are also several annual reports on cataloguing, college libraries, reading for the young, etc. There are no public officers in the country more co-operative and obliging than the librarians. Their desire to promote in every way the use of the collections intrusted to their charge is most commendable. They are rarely paid adequately, and are often overworked; but it is upon their skill, their enthusiasm, their learning, and their courtesy, that investigators, teachers, scholars, and writers of every class depend. The rapid increase of composition in this country is due to them in no small degree, and we predict that in the next five and twenty years there will be a corresponding growth in erudition.

— Prof. C. S. Sargent has republished in pamphlet form his excellent sketch of the career and work of Dr. Asa Gray, which was printed in the *New York Sun* on the seventy-fifth anniversary of his birth. It is the fullest and best account of his work which has been published, and full of interest for every one.

— Dr. Edward Laurens Mark has been appointed Hersey professor of anatomy in Harvard college. The place has been vacant since the death of Dr. Jeffries Wyman.

— A Winnipeg despatch to the *Chicago Tribune*, dated 17th instant, says: The explorations on the line of the proposed Hudson Bay railway from the north-east end of Lake Winnipeg to Hudson Bay, along the course of the Nelson River, have been completed; and Major Jarvis, with his party, reached Selkirk Saturday evening. The party

proceeded to Norway House in the middle of October last, and started from there in canoes, but were frozen in when only twenty-five miles on their journey, and had to abandon the canoes and use sleighs, drawn by men, as the means of transport. Great delay was experienced at first, owing to the larger lakes being still open, as well as some of the rivers, which necessitated a good deal of portaging, and cutting of roads through the woods. Oxford House was reached Nov. 9, the party having followed the usual boat route thus far; and from this point the real work of the exploration commenced. The country was thoroughly examined from the north side of Oxford Lake to the mouth of Nelson River in as nearly a direct line as possible, and the party arrived at York Factory, Nov. 30. On the return journey the line chosen as the result of the previous examination was followed and marked out. Soundings and sections were made at the crossings of the various rivers, and a careful estimate made of the amount necessary to build the line. Major Jarvis touched at Oxford House again Dec. 17, and from that point, following the north shore of Oxford Lake, returned direct to Sea River Falls, on the east branch of the Nelson River, about twenty miles below Norway House. The whole of the proposed railway from Sea River to the terminus chosen at the mouth of the Nelson River, a distance of about three hundred and ten miles, has been actually traversed on foot and thoroughly explored, and the result may be briefly summed up as follows: the line is quite practicable, the rock and earth work being light, with no heavy bridging, nor any work of an exceptional character. It may, indeed, be considered an easy line to construct, the country generally being level, and with a sand or gravel formation. The only rock met with was at the southern end of the line. The timber is not of large size, but enough was found for all immediate requirements. The Nelson River terminus is very favorably situated, being large, flat, well drained, and about ten feet above high water. Major Jarvis was accompanied by R. J. Money, civil engineer, assistant to Mr. Shelford, the well-known English engineer. Mr. Money is also perfectly satisfied with the feasibility of the scheme. The total distance walked over was upwards of a thousand miles.

—The fish commission steamer Albatross will leave Washington, as soon as the ice in the river disappears, for Norfolk, Va., where she will undergo a few necessary repairs, and thence sail for the Bahama Islands, where several months will be passed in scientific research and hydro-

graphic work. An efficient corps of naval officers and scientific experts will accompany the ship, among whom are the following: Lieut.-Commander Z. L. Tanner, commanding; Lieut. H. S. Waring; Lieut. B. O. Scott; Ensign W. S. Hogg; Ensign W. S. Benson; Surgeon J. M. Flint; Passed Assistant Engineer G. W. Baird; paymaster, C. D. Mansfield; chief naturalist, Mr. J. E. Benedict; assistant naturalists, Mr. Thomas Lee and Mr. Willard Nye.

—The gratifying success of hatching cod artificially at Wood's Holl, recently attained by the U. S. fish commission, marks a new era in fish-culture. It is now the intention of Professor Baird to attempt the acclimatization of the codfish in the Gulf of Mexico, and to this end one million of young cod will pass through Washington during the present week *en route* to Pensacola, Fla., to be placed in the Gulf of Mexico.

—Considerable interest attaches to the country around Commander Islands and Kamtchatka. Dr. Leonhard Stejneger of the Smithsonian institution visited this region in 1882-83, and also visited the territory worked over by Steller, bringing back with him many relics of that expedition, and also portions of skeletons of the extinct sea-cow, and of a vast number of birds and cetaceans. The results are interestingly told in Bulletin No. 29 of the national museum, which contains 382 pages, and eight colored lithographic plates from sketches by the author.

—Bulletin No. 30, 'Bibliography of publications relating to collection of fossil invertebrates in the national museum,' by John Belknap Marcou, will be issued in about two weeks. It contains a complete list of the writings of F. B. Meek, C. A. White, and Charles D. Walcott, and is an important contribution to this branch of science.

—The fifth annual ensilage congress met in New York, Jan. 20. There were about two hundred persons present as delegates from all parts of the United States. The opening address was delivered by Mr. Edward Atkinson of Boston, who was followed by S. C. Smith of St. Albans, Vt., Orlando B. Potter, and James B. Brown.

—The chemical division of the U. S. geological survey is conducting a series of interesting experiments with newly acquired material, under the supervision of Prof. F. W. Clarke, who is about completing an investigation of minerals from Litchfield, Me. Among the minerals there existing, a new species of the zeolite family has been found, to which Professor Clarke has given the name of hydronephelite. Messrs. Gooch and Whit-

field are engaged in an investigation of the geyser waters of the Yellowstone park; Mr. R. B. Riggs is making a series of analyses of the lepidolites of Maine, and is also analyzing an undescribed meteoric iron from the collection in the national museum; Mr. Hillebrand is engaged on minerals and rocks from Colorado; and Mr. Chatard is at work upon the associates of corundum from North Carolina, and upon the water of Mono Lake, California.

— A change has been made in the time of issuing the Smithsonian and national museum reports. Heretofore these reports covered the calendar year; but the board of regents of the Smithsonian institution have recently directed that the reports shall hereafter correspond to the fiscal year extending from July to the end of the following June inclusive. The reports from Jan. 1, 1885, to June 30, 1885, are now about ready for the printer; the report of the secretary of the Smithsonian institution to the board of regents, for the first half of 1885, being already published in pamphlet form.

— Bulletin No. 28 of the national museum, recently issued, is W. G. Binney's 'Manual of American land-shells,' which is an enlarged and revised edition of the 'Land and fresh-water shells of North America,' part i., published in 1869, to which subsequently described species are added.

— The *Botanical gazette* for January contains a heliotype engraving of Professor Gray, with a sketch of his life by Prof. C. R. Barnes. Other articles of interest in this number are by Professor Coulter, on the 'Pollen-spore of Tradescantia;' J. C. Arthur, upon a new fungus infesting the clover-leaf beetle, *Phytonomus punctatus*; a new species of *Anemone*, by Professor Gray, etc.

— The first number of the monthly *Journal of the Trenton natural history society* contains a number of short, readable articles, mostly on animal and plant habits.

— The joint commission appointed by the last congress to consider the propriety of consolidating the scientific bureaus of the government have concluded the examination of witnesses, and will shortly submit their report. While their recommendations are not definitely known, it is probable some sort of re-organization will be advised with regard to the signal service, and it may be entirely separated from the army. General Sheridan is authority for the statement that the army does not need this wing of its service, and that there is no objection to placing it under civil control.

— In *Science*, vii. p. 75, in the letter entitled 'An early prediction of the decay of the obelisk,' second line, 'St. Petersburg' should read 'Freiberg.'

— In *Science*, vii. p. 75, in the letter entitled 'Sea-level and ocean-currents,' seventh line, 'Bourdaione' should read 'Bourdaloue;' thirty-third line, 'diversity' should read 'density;' p. 76, second column, thirteenth line, '25 feel' should read '2.5 feet.'

#### LETTERS TO THE EDITOR.

\*.\* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

##### The festoon cloud.

IN *Science*, vii. p. 57, Prof. W. M. Davis, after giving a description of a form of cloud designated 'festoon' cloud, asks if the cloud is commonly seen in this country. I have seen the form of cloud described at least as often as a dozen times within the last six years; but, on account of not having my records at hand, I cannot give the dates.

I have seen the cloud once or twice associated with thunder-storms, but most frequently with the stratus-cloud accompanying 'areas of low pressure,' or cyclones.

The appearance presented to me is that of a cloud-stratum with an irregular base, in contrast with the level base usually seen.

The cloud then presents an appearance as if festoons were hung from it, which are sometimes somewhat circular and rounded, at other times irregular.

The explanation given that they are due to the slow descent of cloud-matter, due to the failure of an ascending current, is, no doubt, the correct one.

H. HELM CLAYTON.

Cambridge, Mass., Jan. 24.

##### Text-books on methods in microscopic anatomy.

The review of Dr. Whitman's 'Methods in microscopical anatomy,' in *Science* (No. 154, p. 64), seems to me not quite just, in that it implies that the author has been negligent in the performance of his task, particularly in regard to that part of it which most gives value to his work; namely, the chapter on embryological methods. In this the author has given a careful summary, the outcome of much laborious and painstaking search; so that we have for the first time a compact presentation of a large number of special methods for the handling of embryological material. It is true that it is not exhaustive, — I am grateful that it is not, — but it contains most of the best results of experience in the difficult art of preparing eggs and embryos of many kinds for microscopical examination. And since it is just in this direction of microscopical embryology that the most earnest and capable zoological energies are now turned, I feel that Dr. Whitman has done science good service by the valuable critical compilation made in the chapter referred to. Now, I wish to find fault with your reviewer because he says that "the arrangement [of this chapter] leaves the impression that it is the result of fortuitous reading rather than a methodical search for the most valuable things

within the scope of the topic." The sentence astonishes me, and leads me to inquire what was the basis of the opinion; for it does not appear to be in the chapter itself, the arrangement of which is intelligent and intelligible, and certainly not based on mere fortuitous reading. The author of the book, if he has read the review, must, one would think, feel mortified to have such a bald accusation of negligence brought against him: I trust, therefore, that you will publish this letter, to show that at least one worker in this field places a higher value upon his volume than your reviewer does, with his paucity of commendation.

CHARLES SEDGWICK MINOT.

Boston, Mass., Jan. 20.

I am under great obligation to Dr. Minot for the kindness he has done me in calling attention to the injustice of my recent review of Dr. Whitman's book. I am myself astonished at it, and cannot comprehend how I could have made so unfair a statement when I intended no injustice.

I said, "This chapter furnishes much valuable information, but the arrangement leaves the impression that it is the result of fortuitous reading rather than a methodical search for the most valuable things within the scope of the topic."

The sentence as it stands leaves me indorsing what, it occurred to me, might be the inference of one who simply looked at the arrangement of the chapter as made up of the separate consideration of so many isolated animals—e.g., *Clepsine*, *Spirorbis borealis*, *Myzostoma*, *Sagitta*, etc.—instead of classes of animals. What I should have added was, that such an impression would be entirely misleading. I had not the least idea of making that impression represent my opinion, but quite the reverse, for it was in direct opposition to my positive knowledge; no one, perhaps, realizing better than I that the author's work had been of the most painstaking and discriminating kind. In my estimation, moreover, there was no zoölogist in this country who possessed in so great a degree the experience and the other qualifications necessary to the successful handling of this topic.

As regards the general tone of the criticism, I can only say that the esteem in which I hold the author made me distrustful of my ability to praise his work judiciously, and that in avoiding one extreme I have fallen into the error of the opposite, and appear only to criticise where there is much more that I ought to have praised.

EDWARD L. MARK.

Cambridge, Jan. 25.

#### Cost of scientific books.

A goodly proportion of the book-notices in your periodical contain a statement to the effect that the publisher has been too profuse in his paper; that he ought to use a poorer and thinner quality, and sell the book at half the price. This betrays a lamentable ignorance on the part of your critics, and, besides, conveys a very erroneous impression. Paper is a very inconsiderable item in the cost of manufacturing a book. It is a good-sized volume which, without the covers, will weigh four pounds, and paper as good as that in most of the books criticised costs only ten cents a pound. The utmost that could be saved by lightening and cheapening would be a third in weight, and two cents a pound in price, thus reducing the cost of the paper of a four-pound book from forty to twenty-four cents, certainly not

enough reduction to allow the price of the book to be reduced from four to two dollars.

The cost of the plates is the greatest item in the production of a book, and the ruling price for this work is eighty cents per thousand 'ems' (a page of Packard's 'Zoölogy' contains about a thousand 'ems'). Then all the cost of corrections, other than mere typographical errors, and the cost of making up the pages and inserting the cuts, are all charged as time-work. The cost of corrections in scientific work is enormous, and I have known it to amount to one and a half times the original cost of composition. A fair average for the plates for a book with the same page and type as that of Packard's 'Zoölogy' would be a dollar and a half a page. This must be considered in settling the price of a book.

Finally, the sale of strictly technical books is very limited. An edition of five hundred is a good average; and, were the price reduced to half the ruling price, the sales would not be increased ten per cent. As it is, they little more than repay the cost of publication, and the reduction so earnestly and ignorantly prayed for by your critics would involve the publisher in a considerable pecuniary loss on every strictly scientific book issued; and a few failures of that sort would make them refuse all scientific books.

I do not wish to be understood as defending the prices put on all publications; for some the charge is clearly extortionate: but, so far as I at present recall, not one of those thus criticised in your columns has a price higher than was necessary to reimburse the publisher for his outlay, and pay him a fair amount for his labor in publishing, advertising, and selling the work. I hope in future your critics will omit any reference to this feature in their fault-finding.

J. S. KINGSLEY.

Malden, Mass., Jan. 19.

#### Oil on troubled waters.

I feel that I must offer a few words of rejoinder to your comments on my letter of Jan. 18, because I cannot admit that there is any grave responsibility involved in my inquiring for the proofs of an alleged scientific theory, or any lack of feeling implied in my protesting against a disposition to hold out a misleading hope to 'the toilers of the sea.'

I have not tried to throw discredit on any well-directed effort to render less dangerous the hazardous vocation of the sailor: I have simply attempted to raise a note of caution against false inductions and specious generalizations. I look upon this as a question of science, not of sentiment; and I have been accustomed to regard science as a matter of hard, clear facts, and keen, cold logic.

It may possibly be that the hydrographic office is affording substantial comfort to the mariner's generally cheerless life by disseminating the fables and traditions of the sea; but, if so, it is a purely literary undertaking, not a scientific one. It may while away an otherwise tedious hour or two on shipboard to read, in effect, that a half-barrel of oil sprinkled over the entire course between New York and Liverpool will insure a safe voyage at any time and in any weather; or that a half-gallon, poured upon oakum, tied tight in a bag, and towed at the stern of a vessel, will reduce the mountainous billows, ease the strained sails and cordage, brace the bending spars and timbers, and bring welcome, peace, and quiet where all before was wild confusion and danger.

But, to a cool-headed landsman, this will appear so astoundingly incredible, that nothing short of the most searching scientific investigation and rigid experiment can give it even a tinge of probability. Either this apparently transcendent miracle is capable of a rational explanation and demonstration, or it is a myth and a delusion. To my mind, the use of the oil-bag upon the ocean is strongly suggestive of the idea of applying a liver-pad to a cyclone.

It is of no avail to quote Pliny or other mere chroniclers, ancient or modern, or to pile up the inexact and awe-inspired tales of seafaring men. I admit that the history of the notion is interesting, like the history of the acceptance of any other prodigy; but there is a wide difference between the progress and persistence of a belief and its scientific truthfulness.

Now, I do not pretend to have seen all the evidence which the hydrographic office has collected or published on this subject, and I shall not undertake to say that relatively large masses of oil, spread upon comparatively small bodies of water, may not, under some circumstances, modify or prevent the formation of waves. But that oil filtered into the raging and turbulent deep at the rate of a quart per hour, — or even a gallon per hour, as reported in the letter printed by you last week, — should prove to be an adequate cause for the marvellous effects attributed to it, is, to me at least, a thing utterly and absolutely inconceivable; and I confess to a disturbance of my faith in any institution that gives such stories credence or currency.

C. F. Cox.

New York, Jan. 24.

### The collapse of the theosophists.

Permit me to take exception to the article entitled 'The collapse of the theosophists' in your issue of yesterday.

I have no contention with any statement, correct or otherwise, which the article contains, and offer no argument *pro* or *con*; but I beg to be allowed to use this occasion to protest against and to obviate the prevalent misconception that 'Blavatsky' and 'theosophy' are synonymous terms, or that either the manners or morals of any individual theosophist necessarily represent the methods, objects, and purposes of the theosophical society.

In my judgment, the 'collapse of the theosophists' is a prediction much safer to make after than before the event; there being, to my knowledge, no organized body of psychological researchers in the world less likely to verify any such prophecy.

ELLIOTT COUES, F.T.S.,

President Gnostic branch, T.S.,  
President Amer. B. of C., T.S.,  
Member Exec. C. of India.

Washington, D.C., Jan. 23.

### Nectar-secreting plant-lice.

Oregon is the place for nectar-secreting plant-lice. During the past fall I received twigs of spruce and willow from that state, which, though not more than six inches long, contained at least a tablespoonful of crystallized sugar, which was both pleasant and sweet. This insect is a species of *Aphis*, and though possibly not equal to the bee, or to the manufacturer of our best cane-sugar, in her power to form an excellent article of sugar does surpass greatly the

glucose factories in the quality of the product which she turns out.

A. J. Cook.

### Sea-level and ocean-currents.

The value of the conclusions arrived at by Professor Ferrel in his article in *Science*, No. 155, headed 'Sea-level and ocean-currents,' depends largely upon a statement made by him; viz., "The recent important determination of the coast and geodetic survey by levelling up the Mississippi valley and across to the Atlantic coast, that the mean level of the Gulf of Mexico at the mouth of the Mississippi is about one metre higher than that of New York harbor."

An item so important in ocean dynamics for comparison of facts with theories should be known to be most unquestionably correct. I am not aware of any official publication of the coast and geodetic survey to which the above statement could be credited, and, what is more, such a line of spirit-levels has never, to this day, been executed by the survey. Probably a paper read before the American association at the Philadelphia meeting in September, 1884, gave rise to the supposed fact. On p. 446 (vol. ii.) of its Proceedings, we find, "Height of bench-mark at St. Louis above mean tide at Sandy Hook 3 feet" (*sic*), and, "Precise line of levels from Gulf, by Mississippi River commission, along the river, shows an elevation of the Gulf of Mexico, near the mouth of the Mississippi above mean tide at Sandy Hook, of about 40 inches." Here the responsibility is placed on the commission.

By permission of the superintendent of the survey, I make the following extract from a report by me, dated May 24, 1883: —

	Metres.
1. Height of coast and geodetic survey bench-mark at the St. Louis bridge above the average or half-tide level of the Atlantic at Sandy Hook, N.J., as ascertained from six years of tidal observations.	126.91
2. This bench-mark was placed at the same level as the so-called St. Louis city 'directrix.'	
3. From precise levels executed by the Mississippi River commission and the U. S. lake survey, St. Louis city directrix above the Greenville, Miss., bench-mark (on bank building), according to letter from commission dated May 18, 1883.	86.185
4. By coast and geodetic survey levels, Greenville bench-mark above the Hampson bench-mark at Carrollton, La.	37.267
5. From Humphreys and Abbot's work on the Mississippi River (1861), p. 110, it appears that the Hampson mark is 8.06 feet or..... above the level of Lake Pontchartrain, which is said to be at the same level as Lake Borgne and Bayou St. Philip, and hence with that of the Gulf.	2.456

Putting these figures together, it would appear that the Gulf level is about one metre above the level of the Atlantic at New York. The report further comments on this result: "While there is nothing impossible in this result, the difference is greater than I [the present writer] expected from the conditions of the case, but it may possibly be greatly reduced when precise data come to hand; and, in particular, more evidence is desirable as to the connection of the Hampson mark with the average Gulf level. We have no checks at present."

It is evident that no probable error can be assigned to the alleged difference, and that the amount itself is greatly in need of confirmation, which it is hoped will soon be reached through the direct line of levels started by the coast and geodetic survey to run from its Illinois line to the shore of the Mississippi Sound.

C. A. S.

# SCIENCE.—SUPPLEMENT.

FRIDAY, JANUARY 29, 1886.

## PROFESSOR LADD ON THE YALE CURRICULUM.

WE presented in *Science* (vi. p. 499) a synopsis of Professor Palmer's article on recent changes at Harvard. We now give an abstract of an article from the same journal, the *Andover review*, on the question of electives, etc., at New Haven, by Professor Ladd of Yale.

The new education, as brought to our notice afresh by Professor Palmer, claims to have discovered that the methods of education in vogue for centuries have been radically wrong: it has organized a college on a wholly new basis.

But the proposed scheme, though revolutionary, and seeming to contradict experience, does not the less merit consideration. Before placing our faith in it, however, we ask, What experience can it boast? What trial has it had at Harvard? We answer, A trial for two years; for only during that short period have youths in the first half of their university course been placed completely under the elective system; and it is to this extension of the system that opposition is chiefly made. More than a generation is necessary to prove the final outcome of such great changes. Is, then, the experience of a single university, during but a moiety of its course, to be considered as sufficient?

But we shall be glad to examine the arguments so well presented and so courteously urged by Professor Palmer, and to compare the tabulated results of the new with those of the older method. Harvard has been chosen as the only thorough representative of the new education; and it is fitting that Yale should be selected to compare with it, partly because, as a teacher there, I am best acquainted with it; and partly because it is the leading representative of more conservative tendencies in education.

But let me first state some points in which I agree with Professor Palmer. I, too, hold that the world of science and learning has greatly progressed of late, and that both the matter and method of education must therefore also change. Sciences and modern languages must be taught, and the ancient classics take a relatively lower place than formerly. But all the best institutions recognize and act on these facts and truths. Within twenty-five years, Yale has made such

progress that much of its education may be styled 'new.' Then, again, along with Professor Palmer, I would measure the success of education by high ethical standards. But do the statistics given show that the new education uplifts character as no other training can? We think we can show that they go rather to prove the contrary. We shall, then, take up, in the order that commends itself to us, the various points adduced by Professor Palmer.

It is urged, that, under the new education, the student's ideal of a 'gentleman' has been enlarged and elevated. Hazing, and such practices, are no longer 'good form' at Harvard. We answer, that it is even so at Yale, where a marked improvement in these regards has been going on for the past twenty-five years. Of other institutions also, to a certain extent, the same is true. The causes of this improvement are not owing to any peculiar method of education, but to the gradual amelioration of customs due to a higher civilization; to the different attitude assumed by parents and teachers towards the young; to wiser dealings with students on the part of college faculties; and, lastly, to the influence of well-regulated athletic sports in giving an outlet for the surplus vitality of the youth.

But it is claimed that the new education is very popular. The growth of Harvard under it has been very great, both in numbers and resources. But, we ask, has it received these generous gifts as tokens of approval of the elective system? Have not other colleges also received very bountiful gifts? During the last fourteen years, Yale has received, either from gifts or by bequest, more than two and a half millions, while its library has increased by eighty-three thousand volumes. Though this sum does not equal that received by Harvard during the same time, yet it tends to throw doubt on the prestige of the new education with the long purses of the country.

The increase of students certainly does show popular favor. We admit that the new education would be likely to be popular with youths of eighteen. But Yale, too, shows remarkable growth during the past twenty-five years. The average number of undergraduates has been as follows: 1861-65, 533; 1866-70, 610; 1871-75, 704; 1876-80, 745; 1880-84, 792. Besides, no other college has rejected so large a per cent of candidates for admission, or sent away so many for failing to keep up to its standard of scholarship.

We find, too, from the last statistics, that more than 55 per cent of the students at Harvard were from the state in which it is situated, while less than 32 per cent of the Yale undergraduates are from Connecticut. The new education is, at all events, not yet cosmopolitan.

Let us next compare Harvard and Yale in the very important point of attendance at college recitations, etc. Professor Palmer thinks it creditable to the members of the last senior class at Harvard that they 'had cared to stay away' at only 16 per cent of all the recitations. At Yale this term, for the seven weeks for which the record is complete, the freshman class showed but 3.7 per cent of absences. In this record are counted absences from all causes whatsoever: it includes the absence of one student through sickness for forty-eight days. The absences in the sophomore class were but a little more than 3.3 per cent. Moreover, all tardiness at a recitation beyond five minutes, and all egresses, count as absences; as does also presence at a recitation, while wishing to be excused from answering. Freshmen and sophomores are allowed but six absences during a term, to cover all such causes as sports, attention to friends, etc.; and yet they did not avail themselves of more than three-fourths of these absences. The junior and senior classes, which are allowed eight absences in a term, showed, during the period of seven weeks, an irregularity of 5.5 and 6 per cent respectively. We may add that the showing for the whole term would probably be better than for the first seven weeks of it.

We see, then, that the irregularity of the Harvard student is from a little less than three to five times as great as that of the average Yale student. The difference is surely very significant as showing the working of the two systems.

Alluding to the "charge of 'soft' courses," "which," he says, "is one of the stock objections to the elective system," Professor Palmer shows us what wise courses the juniors and seniors of Harvard choose. I regret that we are not told how the freshmen exercise their right of option. So far as I can judge, the choices of the Yale juniors and seniors display more taste for hard work than is the result under the new system. No course in classics or in the higher mathematics was a favorite with the two upper classes at Harvard in 1883-84, while 54 juniors and 181 seniors are reported in 'fine arts,' for this year. At Yale this term, however, 53 choices of courses in higher mathematics, and 179 in classics, have been made. The student who has been at regular hard work during his first two years, will be likely to enjoy it in his last two.

Another excellency ascribed by Professor Palmer to the new education is, that under its influence the standard of 'decent scholarship' is steadily rising. To prove this, he cites the marks received by the average Harvard student during the different years since 1874-75. We frankly state that we think such a criterion most unreliable. The students' marks are higher under the elective system, but largely because the teacher, as well as the pupil, is known by his marks; and many students choose their elective because of this fact. Under that system it would be a better test of a pupil's real merits to inquire what courses he takes under teachers that give hard work and low marks.

The new education is also credited with having effected an improvement in the spirit and work of the instructors themselves. We accept Professor Palmer's testimony as conclusive on this point. But in other colleges besides Harvard are to be found the spirit and method which he justly praises; and without them no one should be an instructor under any system. May not, also, a method that makes so much depend on the favor of those taught, develop methods of instruction not conducive to the highest efficiency?

I may remark here that I cannot share the personal experience of Professor Palmer, when he, on looking back upon his college days, feels that more than half of his studies should have been different. My studies at college were wholly prescribed, but they have been none the less of use to me on that account. They have taught me to work hard, and to do patiently every task set before me; and this I would not give for all to be gained from the elective courses of either Harvard or Yale.

But the real matter of disagreement between Professor Palmer and myself is, "why the elective system should be begun as early as the freshman year." This, he says, lack of room precludes him from discussing; adding, "and it hardly needs proving." But here, in my opinion, he is wrong. Yale, with many other colleges, allows much choice to students in their last two years; juniors elect eight-fifteenths, and seniors four-fifths, of their studies. No choice, except that between French and German, is permitted in the first two years. Why, then, am I opposed to the extension given to the elective system at Harvard? Why draw the line between sophomores and juniors, rather than at the entrance upon the freshman year? Why prescribe any courses for the last two years?

The question is simply one of drawing lines. We think, that, after two years' drill at college, the youth can more wisely select his studies than at entrance. Professor Palmer thinks that the



choice should be made all at once, and that at the time when the boy leaves home; that from that time onward he should have the entire decision. We hold, on the contrary, that he should first develop somewhat in his new surroundings, learn better how to study, and what the different courses are, before he has the grave task of deciding. Moreover, a headlong plunge into freedom is not a good thing. I still think, also, that an educated man should enjoy a good training in the five great branches of human knowledge, — in mathematics; in language, including literature; in physical science; in the history of his race; in philosophy. Because, then, I do not think that the new education draws the line in the right place, I am opposed to its extreme measures.

One argument of Professor Palmer hardly admits of statistics. He thinks the type of manliness at Harvard higher than that to be found at colleges that have not so fully adopted the elective system. I reply, that I do not believe the men at Yale yield in manliness to those of any college.

My ideal of cultured manliness in the undergraduate agrees with that of Professor Palmer: as to how best to realize it, we differ. In my opinion, he gives too little weight to the great ethical law of habit, and to the value of the pressure of immediate necessity. We want to train the young to choose right spontaneously, but none of us live solely under the influence of high and remote ideals. Under a system of education, which kindly but firmly invites men to 'choose right,' in view of consequences that come closely home to them, the best characters will be formed.

Having now pretty fully traversed the ground of Professor Palmer's arguments from experience, I wish, in closing, to express, on behalf of the majority of educationists, the fears — honest and strong fears — which they feel as to the ultimate results of the new education.

We fear that the new education will increase the tendency to shallowness, already great enough in American student life. We have already too much smattering of many knowledges. The chief remedy must be to pursue certain topics with persistence and thoroughness. If the average American boy, on entering college, had had the discipline afforded by the drill of a German gymnasium, he might more safely judge for himself. Two years more of continued study of certain prescribed subjects — whatever these may be — is certainly little enough to require of him.

We are afraid of the effects of the new education on the academies of the country. They have been gradually improving under the increased requirements of the colleges; but how shall they meet the demands made by boys, who, under the

new education, may enter college in so many different ways? What interest, also, will boys take in mathematics and the ancient classics, when these are liable to be abandoned so soon as they have attained free election?

We are afraid of the effects of the new education on the higher education of the country, which has been constantly rising for years. The new methods, in themselves considered, are better than the old: and the new learning and science are, of course, far richer than those of the past. But, in order to introduce these, is it necessary to take the direct control from the older and wiser, and leave it to the choice of the inexperienced? Such a course will, in certain lines, destroy all connected and steady discipline in higher education.

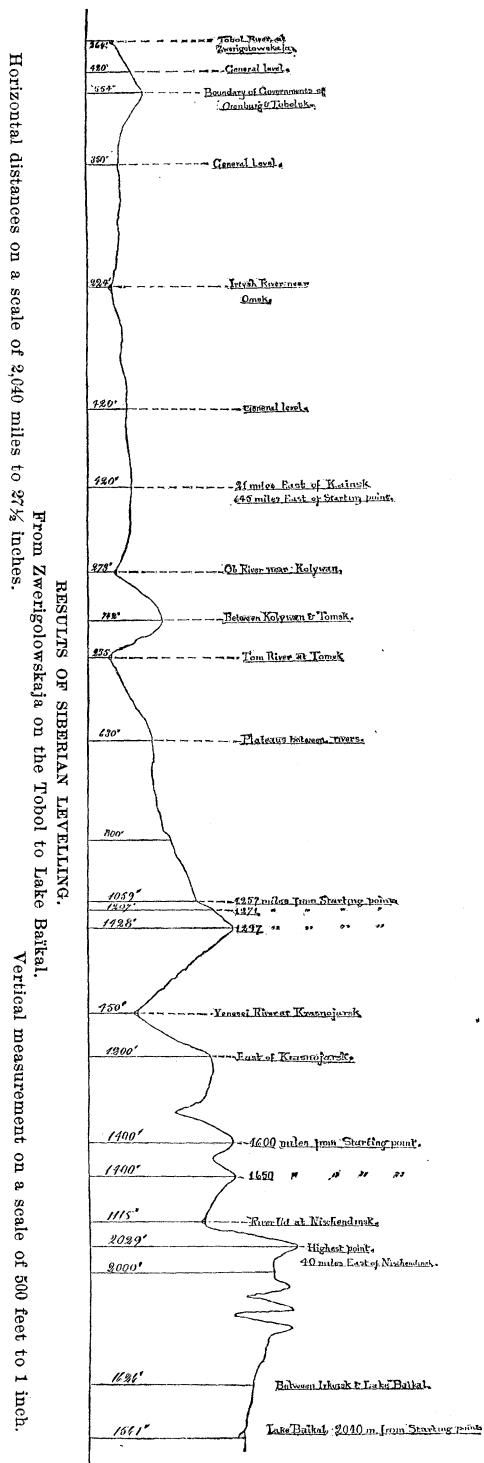
Finally, in spite of Professor Palmer's arguments, we are afraid of the effects of the new education on the character of the youth.

We think we have shown, that in every respect, except that of securing \$175,000 instead of \$250,000 a year, and of making a smaller percentage of annual gain in numbers, the results of the system in vogue at Yale are equal or superior to those at Harvard. We need much more light, both from reason and observation, before preferring the new education to one which is, in our judgment, wiser, though both new and old.

#### THE LEVELLING OF SIBERIA.

THE publication of the results of the Siberian levelling, the largest of the kind yet made, is at last ended. The survey originated in the Imperial Russian geographical society, which petitioned the Russian government to grant the necessary means, setting forth the want of an accurate knowledge of the height above sea-level of a great part of Siberia. The preliminary results were known in 1878, and gave a much greater height for Lake Baikal than was expected. The detailed calculations were delayed from different reasons, among which were the long illness and death of Mr. Moschkow, to whom was intrusted the greater part of the work. It was afterwards given to W. Fuss, who ended it. The whole length of the levelling from Zwerigowskaja on the Tobol to Lake Baikal is 3087.1 versts (2,040 English statute miles). Unfortunately the starting-point is not connected by levelling with the Black or Baltic seas, but by triangulation only, so that an uncertainty of perhaps thirty or even forty feet remains. The results are shown in the accompanying profile.

Gen. A. Tillo has the direction of different levellings under the ministry of public works. In 1884 the mean level of Lake Ladoga over the Gulf of Finland was determined, and found to be 16.3



English feet, while the formerly admitted height was 66 feet. Such a great difference from the formerly admitted height is startling, yet the new figures are the result of so accurate and well-checked operations and calculations that their result cannot be doubted. According to the new determination, the slope of the Neva is about the same as that of the Volga in its middle course, while the formerly admitted heights made it four times greater. To have another check on the height of Lake Ladoga, the barometric means of H. Schlusselfburg were compared with those of St. Petersburg for a mean of eight years. The difference of level of the Ladoga and Gulf of Finland, determined barometrically, is but 8.6 feet; that is, less by 7.7 feet than that determined by levelling. If we suppose both series of observations to be equally accurate, and the instrumental error determined with the greatest precision, this would prove that the mean pressure rises toward the east, — a result quite consistent with the general course of the isobars in Russia; but the difference is rather too large for so small a distance.

Lakes Husen and Onega have also been levelled, and the figures for them will shortly be published. Their height was also found to be smaller than formerly admitted.

A. WOEIKOF.

#### POPULAR PSYCHOLOGY.

SOCRATES, Cicero tells us, called down philosophy from heaven to earth, and introduced it into the cities and houses of men. In each stage of the development of a science an essential step is the diffusion of the general tendencies and results obtained amongst the intelligent public. Nowadays, when each branch of study must make good its claim to a place on the curriculum, it is more than ever necessary to acquaint the cultured and powerful public with the general problems and broad outlines of your science. Thus it has come about that a certain class of scientific men have almost made themselves specialists on the topic of popular science. It is largely to them that the public looks for their scientific enlightenment. A larger and more important class of popular scientists, very fortunately, are the masters of science themselves. When such men as Huxley and Helmholtz prepare with their own hands the scientific food for the public mind, there really must be an inadequate power of reception of such knowledge, if a healthful, wide-spread activity in science is not the result.

Psychology, since it has received the impulse which has made 'physiological psychology' a common description of it, has made sufficient

progress to be able now to give in a popular dress an account of its aims, its problems, its methods, and its results. It is fortunate that Professor Wundt, whose name perhaps, more than that of any other person, has become associated with this modern movement, has given his time to a more or less popular exposition<sup>1</sup> of a few departments of this diffuse subject. The development of experimental psychology has been such a rapid one, that already one must be a specialist in one department of it. To some extent Professor Wundt has confined his essays to an account of work done in his own laboratory, while another portion of the book presents views upon those general problems, interesting to every generation of mankind, which seem to him most adequate and scientific.

In an essay on the problems of experimental psychology, he contrasts the method of this science with that of metaphysics, with which it is historically closely connected, and defends it from the attacks and prejudices of its opponents. On the one hand, the metaphysicians raise the cry that it is only 'crude empiricism,' a mere attention to natural phenomena, a lower field of work, perhaps good enough for those who are willing to enroll themselves in such a cause; while the nobler, higher flights of pure philosophy, where every problem finds its solution worked out with a wonderful ease and regularity, are widely open to him. On the other hand, the exact scientists regard this new aspirant for a place amongst the sciences with a suspicious distrust of the justness of its claim. The best answer to the first is to prove to him that many of the problems discussed, *pro* and *con*, by various metaphysical schools, can be brought into the laboratory and solved there with the aid of suitably devised apparatus. The answer to the latter will be a demonstration that within natural limits the same regularity and predictability that characterizes his own work, also holds in experimental psychology. In other words, it is the 'measurement of psychic processes' (the subject of the next essay) that forms one of the main problems.

The beginning of all culture is a clock. Where the conditions of life are so primitive that a time standard is unnecessary, there can be little mental development. For measuring time, man need not invent an apparatus, but has only to learn to tell time on the world-clock, the movements of the heavenly bodies. But it is to be noted that time, though objectively measured, is really a psychic process; for our perception of time is not changed when the clock stops, but is changed when we fall asleep. One by one the measurements of physical

phenomena are required, and last comes the utilization of these physical measurements for measuring the psychic processes. The first time sense is the flow of sense impressions; the last step is to turn back and measure these impressions. Some sort of philosophy or psychology appears early in history; then come the great advances of physics; in the last stage, a psycho-physics.

Perhaps it is only a coincidence that it really was a branch of physical science, astronomy, that performed the first experiment which led to the long series of studies of psychic time. Even a martyr can be pointed out in this cause; for it is told that an observer at Greenwich, whose observations were unusually slow, was often boxed on the ears for this peculiarity, and afterwards discharged. Twenty years later Bessel saved the honor of our martyr by pointing out that each person had a 'personal equation' of his own; that it took an appreciable time to record an observation after it was made, which time differed in different individuals. If we were asked to press a key as soon as we saw an expected flash of light, it would seem to us that the reaction was instantaneous. But still ordinarily it takes from an eighth to a sixth of a second. About a half to a tenth of a second is taken up in central brain processes, while the rest is used in conducting the impression to and from the brain. If, instead of reacting when we saw the light, it was agreed that the reaction should take place only after the color of the light had been perceived, the additional time necessary for perceiving this color might be called the 'distinction' time, and would vary from a twentieth to a fiftieth of a second. In this way the time necessary for hearing syllables, words, seeing colors, figures, pictures, letters, and so on, and understanding them, is open to measurement, and the relative time required for these operations marks their complexity. Again: we can agree, that, if you see a blue light, you are to react with the right hand; if a red, with the left. Here is, first, the time for perceiving a light already measured, then the time to distinguish its blueness or redness, also measured, and then the 'choice' time necessary for selecting the appropriate hand for the color seen. This last psychic process takes about as long as the 'distinction' time. Of course, it depends on the number of reactions from which the choice is to be made. If it is one of two, the time would be a tenth of a second; if one of ten (say, the ten fingers), the time would be half a second. A rather curious result of these observations is, that it takes almost as long to perceive a single letter as it does to perceive a one- or two-syllable word, which shows that the word is perceived as a whole, not as a combination of letters, — that it is

<sup>1</sup> *Essays*. By W. WUNDT. Leipzig, Engelmann, 1885.

the psychic unit. The next step takes us still further into the nature of mind by measuring the time necessary for one idea to call up another related to it in any way,—‘association time.’ This process is evidently a more complicated one, a higher function, and takes a longer time, about half to three-fourths of a second. Individual differences are very great here, and we are at the beginning of those mental qualities which in their extremes distinguish the genius from the dullard. Not only the time, but the kind of association, is characteristic of the individual. The direction of one’s associations is as good a clew to his character as can readily be gotten. If we limit the subject to one kind of association, for instance, what the logicians call ‘subsumation’ (that is, for example, if the word is ‘horse,’ the associated word must include horse as ‘quadruped,’ ‘animal’), the time is longer by about a tenth of a second than unrestricted association time.

Another very curious result which was wrought out in Professor Wundt’s laboratory is the peculiar effect of attention, which actually makes you hear or see a thing before the thing is there to be heard or seen. If you are to observe opposite what stroke of a graduated circle an indicator attached to a pendulum is swinging when a bell strikes, then, after the interval between the beginning of the swing and the ringing of the bell has become fixed in your mind, you will anticipate the stroke of the bell, and make it ring a fraction of a second before it really sounds. But a further discussion of this question would carry us too far. It has been shown, that, compared with such motions as light, sound, or electricity, nerve-conduction is slow, and those nerve processes associated with the more complex sensations and perceptions very slow indeed; that by measuring these times we will obtain a graded scale of the complexity of some of the simpler mental processes, and gain a deeper insight into their nature.

This essay has been selected because it represents, perhaps, the more strictly original part of the book better than any other. Most of the others are inspired by new points of view, as, for example, the one on language, which takes its basis from the observations on the development of language in children and deaf-mutes.

From the English side comes an attempt to give in a popular form the results of studying the insane and deranged as far as such study bears on certain peculiar historical and psychological facts.<sup>1</sup> One general topic in which the author is deeply interested is the hallucinations of eminent historical characters. The list of these is so strikingly

large, if one is willing to take into account very small deviations in mental soundness, that it has led to the thesis (old as Aristotle) that genius and insanity are closely allied. But the cases treated by Dr. Ireland are only those in which this hallucination gave character and motive to the life of the individual. The peculiar mental condition of Mohammed, Swedenborg, and Joan of Arc, are graphically and instructively presented: they form a welcome contribution to the psychology of greatness. In this connection may be mentioned a work on genius,<sup>1</sup> recently published, which, though it makes no claims to be, and is not, a scientific book, touches with a somewhat literary motive on this topic. The writer has made a strong statement of the vanities of eminent men; not of men of genius, however, in any proper sense.

Another peculiar malady which the flesh of the great is heir to, is the ‘insanity of power.’ The proposition is, that persons in positions in which all their wishes and whims can be put into deeds at once, are liable to become intoxicated with this omnipotence, and to indulge in morbid and cruel practices. The horrible spectacles which the reign of the Claudian-Julian family of emperors at Rome, reaching the climax in Nero, presented to the world, shows the terrible force of this disease, and its hereditary nature. The reigns of Ivan the Terrible in Russia, and of Mohammed Toghluks in India, are other examples of the debasing effects of unchecked power, while the hereditary neurosis of the royal family of Spain illustrates the special dangers to which these select families are subject.

Another line of interest with Dr. Ireland is the study of the relation of the two sides of the body. As the main motor nerves cross from the brain to the opposite side, we are right-handed and left-headed. This predominance of the left hemisphere of the brain is an indication that the two hemispheres only in part are one, and in part are two. Have we one brain or two brains? is, then, not at all an unnecessary question. The peculiar phenomenon of mirror-writing (i.e., of writing from right to left, so that when reflected in a mirror it appears normal), which appears in children and some forms of insanity, has attracted notice to this question. The results as yet are not very definite. Other psychological curiosities, such as sympathetic insanity, which makes whole families go insane at once, peculiar fixed ideas, and so on, are treated in a popular way. The book will not say much that is new, but gives in a very readable form an interesting account of some of the modern phases of psychological thought. J. J.

<sup>1</sup> *The blot on the brain: studies in history and psychology.* By W. W. IRELAND, M.D. New York, Putnam, 1886.

<sup>1</sup> *Insanity and vanity of genius.* By KATE SANBORN. New York, 1886.

## IRON CONFERENCE AT ST. PETERSBURG.

THE meetings of the Russian iron and coal trades conference at St. Petersburg have been marked, says *Engineering*, by an acrimonious discussion between the representatives of the older Ural establishments and the newer ones in the Baltic provinces and South Russia. The former date from the time of Peter the Great, when that monarch, by generous and well-directed state support, gave such an impulse to the charcoal iron trade that Russia became the leading iron-producing country in Europe. For a considerable period pig-iron was one of the principal products Russia exported to this country. In the beginning of the century, however, mineral coal began to prove a formidable competitor to charcoal in smelting-operations; and ultimately the tables were turned, and Russia received most of her iron from England, instead of supplying her with it. This revolution was marked by the collapse of the Ural iron industry, the ruin of which was accelerated by the wasteful destruction of the forests, and the extravagance of descendants of the iron-masters enriched by the support of Peter the Great. Twenty years ago the Russian government wanted to encourage the manufacture of rails, etc., for the home railways, and, finding the Ural firms disorganized and ruined, created a new industry at St. Petersburg, Briansk, etc., by giving large and lucrative contracts to a number of Russian and foreign capitalists. As coal and iron do not exist in the immediate vicinity of the Baltic, these new ventures were dependent upon foreign iron and coal for their sustenance, and have never been other than weaklings since their birth. The government is now tired of continually altering the tariff, and giving subsidies to these undertakings; and the attitude of neutrality it has taken up has had the effect of placing most of them more or less on the verge of ruin: hence the delegates representing them have been vehement in their demands for support; and, the support they want being precisely the opposite of that which would revive the Ural iron trade, the battle between the 'independent works' (i.e., using only Russian iron and fuel, as in the Urals) and the 'dependent works,' which cannot exist without foreign iron and coal, has been a tough one, accompanied by scenes of personal and undignified wrangling. It is hardly possible for the government to support one without injuring the other; and, as both are equally rotten, it is angrily disposed towards each of the industrial parties. Probably no branch of Russian trade has 'milked' the financial resources of the government more than the iron trade; and prosperity

and progress have attended so few of its efforts, that the government is almost tired of dispensing its support.

## LONGEVITY.

It has been stated, with some degree of reason, says the *Lancet*, that the maximum age attainable by man has risen somewhat during the present century over that recorded in former ages. In judging of such statement, some allowance for error must be made. The exact statistical calculations of our day should not, in fairness, be marshalled against the round numbers of less accurate traditions. The fact remains, nevertheless, that the limit of seventy years is now very frequently passed. Fourscore may even be reached by some without excessive labor and sorrow, and we have among us nonagenarians who carry on with still respectable proficiency the activities of their prime. Such effective longevity is a bright spot in the history of our advancing civilization. Its comparative frequency, and its association with different physical types, suggest a certain generality in its origin, and encourage the hope that it may be, in some measure at least, dependent on personal conduct. It has been stated that no such condition can influence the length of life after middle age. After that period, inherited vital force is the only potential factor. To some extent this may be granted. If we fix an average of conduct, and suppose that a number of persons conform to it, we should certainly find the purest and most powerful constitutional types outlive the others. For instance: a gouty tendency does not enhance the prospects of old age. A rheumatic one is little better in this respect. The scrofulous are heavily weighted in the race of life by the chances of several infirmities. Nervous persons, again, are wiry, and may live through much trouble in virtue of their elastic tenacity. Then there are nondescript diatheses, which, except in their remote history, present no definite physical bias. Theoretically, these are most likely to furnish, under ordinary usages, the old men of a given time.

It will be at once evident, however, that these are general statements, and that an unlikely individual will often exceed his own expectation of life, and by care, or from the suitability of his circumstances, will reach old age. In weighing the value of constitutional tendencies, moreover, another nearly related quality should be considered. This is disposition. The mind of a man must be more or less of the nature of his body, and accordingly we expect to find, and do find, that mental habit reflects in preferences, varia-

tions, rate of action, and the like, the type of processes in the lower tissues. So far disposition is merely a part of constitution; and cheerfulness, hope, apathy, or gloom are only expressions of physical change. That all such qualities react upon the body in such a way as to influence its vitality, is undoubted. On the other hand, they may certainly be overruled by the action of the will, so as to be no longer mere bodily impulses, but trained servants of a governing intellect. They may thus acquire a compensatory value in correcting faults of constitution, and strengthen in proportion the tenure of life.

This brings us to the sphere of intelligent effort. There can be no doubt, in our opinion, that there is much room for exercise of private judgment and energy in seeking the prolongation of one's own life. If there is any known diathetic fault, this implies a law of one's being which will repay in a gain of vitality the man who recognizes it, and guides himself accordingly. The doctrine of the 'survival of the fittest' does not work itself out by blind chance, or without evident design, even among the lowest forms of life. Much less is it to be believed that man is unable so to adjust his circumstances to his needs as to continue to live after a certain mean period. The weaker will sometimes prove himself the more tenacious of life by observing rational methods of living, of which the more robust is careless. Moderation has probably more to do with success in this respect than any thing else. To eat sufficiently, and drink stimulants sparingly, to alternate work with adequate rest, and to meet worries heartily, will afford to every one the best chance of arriving at a ripe old age.

SOME interesting particulars of the German universities have recently been published by the *London illustrated news*. There are, it appears, twenty-nine now existing, including those in the Austrian empire and Switzerland, and the Russo-German university of Dorpat. Twelve have ceased to exist, with only one exception during the first sixteen years of the present century. The oldest is Prague (1348); the youngest, Czernowitz (1875). Six have been founded during the present century, among them four of the most important, — Berlin, Bonn, Munich, and Zurich. The number of students in the universities belonging to the German empire has risen from 14,808 in 1830, to 23,207 in 1883; but the percentage to the population is exactly the same. This percentage had declined very greatly during the intervening epoch, but has been rapidly recovering itself since the renovation of the German empire in 1871. The per-

centage of students of Catholic theology has declined during these fifty-three years from 12 to 3, mainly owing to the establishment of seminaries under direct Episcopal control. Protestant theology also exhibits a falling-off in percentage from 27 to 13, but the actual number of students is diminished only by a fourth. Jurisprudence has gained in number, but suffered in percentage. Medicine has more than doubled its numbers, and philosophy nearly quadrupled them, the percentage of the two united being 52, against 32 in 1830. The students of the exact sciences in the philosophical faculty are now 37 per cent, against 13 per cent in 1841.

It has been estimated, says the *New York medical record*, that one-half the adult men of American birth living in our cities are bald-headed. The estimate is not exaggerated, if it is applied to persons above the age of thirty, and it may be rather under the mark. If, now, it be conceded that one-half of our American business and professional men are bald at the present time, it would be interesting to speculate as to the condition of the heads of their descendants some hundreds of years from now. The probabilities point toward a race of hairless Americans, for baldness is extremely liable to be propagated in the male line, and to appear a little earlier in each generation. The American nation is threatened with the catastrophe of a universal alopecia. The cause is usually imputed to the excessive strain and ceaseless mental and physical activity to which our methods of business and modes of living conduce. From the visitors' gallery of the stock exchange, for example, one views a mob of shining pates, belonging, as a rule, to rather young men.

The much neglected scalp should be thoroughly cleansed at certain intervals. It should be carefully and regularly examined, and if it be unhealthy, dry, and scurvy, the proper applications should be made to it. The wearing of unventilated hats is one of the greatest sources of failure of nutrition of the hair, and these must be avoided. The beard never falls out, because it gets plenty of sunlight and air. These are what the hair of the scalp needs also. Women are less bald than men, because, for one reason, their scalps are better ventilated. In fine, civilization has made the hair-producing organs of the scalp delicate and feeble. They have to be nursed and cared for, or they atrophy and disappear. Young Americans who do not wish to lose their hair before they are forty must begin to look after their scalps before they are twenty.